Power Analysis / Statistical Power

What is Power? → Probability of rejecting H_0 when it is false.

Possible Statistical Conclusions :

	Null hypothesis (H_0) is :	
	False	True
False. Rejecting H_0 ($P < 0.05$)	Correct Inference. True Positive $(1-\beta)$	Type 1 error False Positive (α)
True Fail to reject H_0. ($P > 0.05$)	Type II error False Negative β	Correct Inference True Negative

Judgement of Null (statistical Result)

So if power = 80% . this means 80% power means you have an 80% chance of getting a significant result when the effect is real.

Example — Men are tend to be taller than women. And the power = 80%.
So we can say that if we take 100 sample, then 80% will show prove that result.

Why it is important?
→ Power tells you how likely you are to detect a real effect.
→ 80% of power means we'll miss a real effect approximately 20% of time.
→ Want to find an initial effect and a replication given 80% power. We will find this 64% of the time. Because when we have two condition, we multiply = (Initial effect) × (Replication effect) = $(0.8) \times (0.8) = 0.64 = 64\%$
→ Main purpose of power analysis is to help to determine the smallest size that is suitable to detect the effect of a given test at the desired level of significance.

FACTORS AFFECTING POWER ANALYSIS
→ Factor affecting the power of analysis is the strength of association or strength of an relationship between two variables. The greater the strength of association is, the more power in the power analysis. This means that a greater strength of association leads to a greater value of a power analysis.
→ Variation in dependent variables also affect the power. Larger the variation in dependent variable the value of power of power analysis may go down/lower.
→ Sensitivity affect the power analysis. Sensitivity refers to number of true positive out of total true positives and false negative. In other word, power analysis recognized truly correctal data. This mean that highly sensitive data will yield data with high power analysis.

Main Use of Power analysis —
Power analysis is normally conducted before data collection. Main purpose is to determine the smallest sample size that is suitable to detect the effect of a given test at desired level of significance. Ideally, people use smaller sample because larger sample are often costlier (computation is costly).